Transfer of KPC-2 carbapenemase from *Klebsiella pneumoniae* to *Enterobacter cloacae* in a patient receiving meropenem therapy


**Abstract**

The horizontal transfer of a plasmid bearing the *bla*KPC-2 gene from *K. pneumoniae* to *E. cloacae* infecting the respiratory tract of a patient during meropenem therapy was elucidated. This finding is particularly worrisome, since these drugs are of last resort for multidrug-resistant Gram-negative pathogens.

**Keywords:**

*Klebsiella pneumoniae*

*Enterobacter cloacae*

*b*la*KPC-2

Horizontal gene transfer

Plasmid

Carbapenems are the most effective antibiotics for the treatment of infections caused by multidrug-resistant Gram-negative bacteria, mainly extended-spectrum beta-lactamase-producing Enterobacteriaceae. In this regard, the wide dissemination of the *Klebsiella pneumoniae* carbapenemase (KPC) among members of the Enterobacteriaceae family has become a global issue, since KPC can hydrolyze all β-lactam antibiotics (Doi and Paterson 2015). Moreover, most KPC producers often exhibit co-resistance to aminoglycosides and fluoroquinolones, dramatically limiting treatment options (Morrill et al. 2015). Pandemic KPC has occurred primarily by the dissemination of KPC-producing *K. pneumoniae* isolates belonging to international clones. On the other hand, the *bla*KPC gene, which is frequently located in transposon Tn4401, and carried on conjugative plasmids that vary in size and structure, can spread among clinically significant Gram-negative species by horizontal gene transfer (HGT) (Mathers et al. 2015). Evidences for HGT of the *bla*KPC gene is supported on the isolation of several KPC-producing Enterobacteriaceae species in the same patient (Goren et al. 2010; Kocsis et al. 2014).

On January 16, 2014, a 57-year-old man was transferred from a local medical center to the emergency department of the Hospital de Base de São José do Rio Preto, in São Paulo, Brazil. During admission, the patient presented pallor, cold sweats and dyspnea, and reported epigastric pain of high intensity, irradiating to the back. Previous medical history enclosed diabetes mellitus, hypertension, congestive heart failure by trypanosomiasis and an ischemic stroke. Chest computerized tomography showed a type B aortic aneurysm without rupture with partially thrombosed false lumen and bilateral consolidation in lung parenchyma plus pleural effusion. He was transferred to cardiac intensive care unit (C-ICU), presenting mental confusion, tachypnea and hypertension, evolving with worsening of symptoms and consciousness impairment.
Fig. 1. PFGE profile and antimicrobial susceptibility profiles of E. cloacae strains EcTA01 and EcTA02. Black squares (resistant), gray squares (intermediate resistance), white squares (susceptible), SAM (ampicillin/sulbactam), TZP (piperacillin-tazobactam), FOX (cefoxitin), CAZ (ceftazidime), CTX (cefotaxime), FEP (cefeplime), ETP (ertapenem), IPM (imipenem), MIR (meropenem), AMK (amikacin), GEN (gentamicin), CIP (ciprofloxacin), TIG (tigecycline), COL (colistin). • Fig. 1 is a 2-column fitting image.

Fig. 2. Comparison of plasmids harboring the bla\textsubscript{KPC-2} gene from K. pneumoniae KpU01 (A: pKP4368, GenBank accession number KX783441), E. cloacae ECTA02 (B: pEC4365, GenBank accession number: KX783439) and K. pneumoniae KpTA01 (C: pKP4365, GenBank accession number KX783440). • Fig. 2 is a 2-column fitting image.
the carbapenems are often considered of last resort for multidrug-resistant Gram-negative bacterial infections.

**Conflicts of interest**

None.

**Funding**

This work was supported by the São Paulo Research Foundation (FAPESP) [research grant number 2014/17184–0].

**References**


